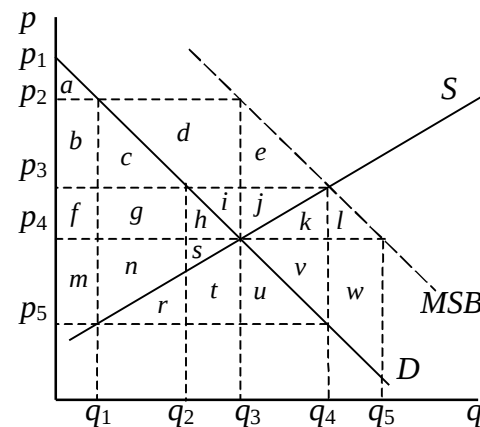


Name:
Student No.:

SPP/Econ 573
Benefit-Cost Analysis
Midterm Exam No. 2
April 10, 2000

Answer all questions, on these sheets in the spaces or blanks provided. In questions where it is appropriate, **show your work**, if you want partial credit for an incorrect answer. Point values of the questions are shown; there are a total of 54 points possible.

1. (16 points) The figure at the right shows private supply and demand, S and D , in the market for a vaccine. It also shows as a separate curve, MSB , the marginal social benefit from use of the vaccine, which is higher than the private benefit because of a positive externality. All the curves are straight lines, and MSB is parallel to D .



- a. (8 points) Using the quantities, prices, and areas labeled in the figure, identify the following:

- i. The socially optimal quantity to produce. _____
- ii. The socially optimal price to charge demanders. _____
- iii. The socially optimal price to pay suppliers. _____
- iv. The net gain to all of society (including suppliers and demanders) due to moving from the market equilibrium to the social optimum. _____

- b. (4 points) In the same market as part (a), suppose now that the government decides to buy some quantity of the vaccine itself and give it away free to certain consumers. Taking account of the effect of this purchase on the market equilibrium, how much of the vaccine should the government buy, and to whom should it give it, in order to achieve the social optimum? For this purpose, assume that each individual can use only one unit of the vaccine, so that the demand curve represents not only the quantity consumed but the number of consumers, and people can be represented by the price they were willing to pay for the vaccine. Thus

Using the “ q ’s” from the figure, how much vaccine should the government buy? _____

To whom should the government give this vaccine?

- c. (4 points) Returning now to the situation in which the government does **not** buy any of the vaccine, suppose that it instead sets a price ceiling in the market equal to price p_5 in the figure. That is, it makes it illegal for sellers to charge a price higher than p_5 and it enforces the law perfectly. Sellers in turn ration the vaccine by selling it to those consumers who **wait in line** (queue) for it at a pre-announced time and place. Assuming that all consumers have the same cost of waiting in line and that they correctly anticipate the minimum time that they’ll need to wait in order to get some of the scarce vaccine,
- Who will get the vaccine?
 - About how much do these consumers (who get the vaccine after waiting in line) benefit from having it available on these terms, compared to it not being produced at all?

2. (9 points) Determine the following present discounted values using the interest rates indicated:
- a. (2 points) The present discounted value, at an interest rate of 2% per year, of \$1200 starting two years from now and continuing annually, with the last payment 25 years from today.
 - b. (2 points) The present discounted value, at a nominal interest rate of 8% and with a rate of inflation of 3%, of a nominal annual payment that is \$150 one year from now and that rises thereafter, in nominal terms, at a rate of 6% a year forever.
 - c. (5 points) The present discounted value, at each of the interest rates listed below, of an investment project that **costs** \$12,000 one year from now and yields a **benefit** of \$600 every year thereafter (starting two years from now) forever.
 - i. Interest rate = 4%
 - ii. Interest rate = 6%
 - iii. How do these answers compare, and why?

3. (9 points) Using the method of required compensation, answer the following questions.
- a. (2 points) Long-distance truckers have a frequency of accidents on cross-country trips of 1.5 accidents per 100 trips. Drivers of tanker trucks, filled with flammable liquids like gasoline, have no more accidents than others, but when they do have accidents, the drivers are more likely to be killed. 1.2% of accidents are fatal to the driver in normal trucks, but 3% of them are fatal to the driver in tanker trucks loaded with gasoline. Knowing this, drivers demand an additional \$1200 per cross-country trip to drive such tankers. On the basis of this information, what is the value of a trucker's life?
- b. (2 points) Until recently, out of a population of 150,000 professors in the United States, an average of ten would die every month from White Lung Disease – an affliction brought on by inhaling chalk dust. Recently, some university administrators have begun a move away from using chalk, toward using white boards and markers, or even PowerPoint presentations. Several have replaced all chalk boards and simultaneously reduced the salaries of professors by \$1000 a year because of the reduced need to compensate for risk. The price was apparently right, since few professors have sought to transfer either into or out of those universities that have adopted this policy. Again, on the basis of this information, what is the value of a professor's life?

- c. (3 points) Give three reasons why one or both of the estimates in parts (a) and (b) may under- or over-estimate the amount that analysts should use to value the risk of loss of life for the general population.
- d. (2 points) Using a value of life of \$5,000,000 and a value of time of \$12/hr (=20¢ per minute), how much extra time should a student be willing to devote to crossing Huron Street to the SPP Annex at a safe crosswalk rather than crossing where it is more convenient and being killed by a car with a probability of one in 10,000,000 (0.0000001).

4. (6 points) Suppose that the best available standard method of redistributing income from the non-poor to the poor has a Leaky Bucket Ratio of 25%. Each of the following represents the effect on the well-being of the non-poor and poor of particular project that is being considered for implementation. Evaluate each of them separately from the standpoint of the leaky bucket ratio: Tell whether each should be implemented or not, and show why.

a. $\Delta Y_N = +1000$; $\Delta Y_P = -800$

b. $\Delta Y_N = -500$; $\Delta Y_P = +400$

c. $\Delta Y_N = +15,000$; $\Delta Y_P = -11,000$

5. (14 points) The wage of unskilled labor in the village of Arbordale is currently in competitive equilibrium at $w^0 = \$5$ per hour with a quantity supplied and demanded of 10,000 hours per day. At this wage, these workers are among the poorest of the village's population. The elasticity of labor supply in this market is $E_S = 3.0$, while the elasticity of labor demand is $E_D = (-)1.5$ (demand is downward sloping). In an effort to alleviate the poverty of unskilled workers, the village plans to provide a subsidy to the employment of unskilled labor of \$1 per hour.
- a. (4 points) Calculate by how much the competitive equilibrium wage received by unskilled workers will rise due to this policy.
- b. (4 points) How much, therefore, is the new quantity of labor supplied (and demanded) with the subsidy, and how much does the village government spend on the subsidy?

- c. (4 points) Calculate the amounts by which unskilled workers and demanders of unskilled labor both gain from this subsidy.
- d. (2 points) Using your knowledge of how markets work, explain whether and under what circumstances you would be able to recommend this policy. You **not** need to do any calculations for this, and indeed you don't even need to have done parts (a-c) at all. Just indicate the nature of any calculation that you **would** do if you had enough information.